TECHNICAL NOTES

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Initial Effect of Residual Stocking Levels on Basal Area Production in Northern Hardwood Stands

Selection management in old-growth northern hardwood stands has been under investigation in the Lake States for the past 30 years. Past studies indicated that this timber type reacts favorably to all-aged management with satisfactory yields from periodic cuttings made at relatively short intervals. From these early studies we also learned that growth in partially cut stands was related to residual stand density.

In 1951 a stocking level study was initiated to provide additional information on the relationship between residual stand density and growth, quality, and composition. The experiment was designed to test the following stocking levels: 30, 50, 70, and 90 square feet of basal area per acre in trees 10 inches diameter breast high (d.b.h.) and larger.

Three replications were established in fully stocked old-growth hardwood stands on the Dukes Experimental Forest. These stands were typical of northern hardwoods which grow on the better-drained sites of the Upper Peninsula. Before cutting they contained from 110 to 120 square feet of basal area per acre and about 15,000 board feet gross or 11,000 board feet net. Sugar maple, the predominant species, comprised about 75 percent of the net volume. Yellow birch accounted for 17 percent.

Five years after cutting, the stands were remeasured to determine net growth, mortality, and gross basal area production. Net growth equals the change in basal area which occurred during the 5-year span. Mortality measures total stand losses during this period. Gross basal area production is a combination of net growth and mortality and measures total productive capacity.

A summary of the 5-year changes in basal area increment showed that some of the differences in growth and mortality were attributable to the level of residual stocking (table 1). The gross basal area production of the 30-foot stocking level was significantly less than the gross production in stands with a residual stocking of 50, 70, and 90 square feet. Although there was no significant difference between levels of 50, 70, and 90, a residual stocking of 70 square feet had both the largest gross and the largest net production. In terms of board-foot growth the basal area production in the 70-foot level is equivalent to an annual increment of approximately 170 board feet per acre. Net annual growth in stands with either 50 or 90 square feet of basal area was about 150 board feet per acre. It was only 100 board feet per acre in stands with a residual stocking of 30 square feet.

(over)

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Residual stocking level had no significant effect upon the basal area production of understory trees 5 to 9 inches d.b.h. The trends, however, were just the opposite to those observed for overstory trees (table 2). The basal area production of these smaller trees was greatest in the 30-foot level and least in the 70. Losses, however, were also greatest in stands with a residual stocking of 30 square feet.

Table 1.--Change in basal area for trees 10 inches d.b.h. and above during the 5 years following the initial cut

(In square feet per acre)

Residual stocking level	Basal area following first cut	Basal area 5 years later	Net growth	Mortality	Gross basal area production
30	29.3	33.6	4.3	1.5	5.8
50	47.6	53.5	5.9	1.3	7.2
70	67.0	73.5	6.5	1.3	7.8
90	84.2	89.4	5.2	2.2	7.4

Table 2.--Change in basal area for trees 5 to 9 inches d.b.h. during the 5 years following the initial cut

(In square feet per acre)

Residual stocking level	Basal area following first cut	Basal area 5 years later	Net growth	Mortality	Gross basal area production
30	8.2	9.1	0.9	1.0	1.9
50	8.1	9.6	1.5	.2	1.7
70	8.6	9.7	1.1	.2	1.3
90	7.8	9.1	1.3	.2	1.5

The period immediately following the initial harvest is primarily one of adjustment for all stand components. Trends in basal area growth established during this 5-year span, therefore, may not be indicative of those occurring in the future.

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